SECTION 618
TRAFFIC CONTROL

618.01 DESCRIPTION. This work is the furnishing, installing, and maintaining of traffic signs, barricades, lights, signals, pavement markings, and other specified traffic control devices. It includes flagging and pilot car operation and furnishing and applying water for dust control.

618.02 MATERIALS. Furnish materials meeting the Contract requirements, the MUTCD, and the following:

Reflective Sheeting	Subsection 704.01.10
Temporary Pavement Marking Tape	Subsection 714.01
Temporary Pavement Marking Tabs	Subsection 714.02
Preformed Plastic Pavement Markings	Subsection 714.03
Traffic Line Paint	Subsection 714.04
Signs and Channelizing Devices	Subsection 715.01
Portable Sign Support Assemblies	Subsection 715.02
Advance Warning Arrow Panels	Subsection 715.03
Warning Lights	Subsection 715.04
Flagger Ahead Warning Signs	Subsection 715.05

618.03 CONSTRUCTION REQUIREMENTS.

618.03.1 Purpose and Prosecution of Work Zone Traffic Control. Schedule construction and provide work zone traffic control to accomplish the following :

1. To provide the protection, safety, and convenience for motorists, pedestrians and for construction personnel protection and safety.
2. To advance the project work in the most beneficial manner to the public.

Provide work zone traffic control for all construction activities on the roadway and within the clear construction zone and other specified areas. The construction clear zone is the area within 30 feet (9.2 m) of the edge of a traffic lane.

Furnish work zone traffic control meeting the Contract requirements, the MUTCD, and the approved traffic control plan.

618.03.2 Traffic Control Plan. A general traffic control plan is included in the Contract. The Contractor may develop and submit an alternate plan for approval.

The Contractor's alternate traffic control plan must address signing, channelization, location and purpose of flaggers, pilot vehicle use, and the travel and merging of hauling units.

Obtain approval of the alternate plan before using it.

618.03.3 Traffic Control Conference. Attend a work zone traffic control conference organized by the Project Manager before starting work that alters the public's use of any roadway. The provisions for traffic control proposed for each stage of construction will be reviewed.

618.03.4 Traffic Control Reviews. Designate personnel to be responsible for traffic control work and its continuous surveillance. The designee(s) must be available 24 hours a day to respond to calls concerning damage to traffic control devices from any cause. Provide the Project Manager, at the preconstruction conference, the name(s) of the person(s) responsible for the surveillance.

The Project Manager and the designee(s) will conduct periodic reviews of the traffic control throughout the work to insure compliance with the traffic control plan. The reviews will be conducted at night, during adverse weather conditions, when construction work is active and inactive, and at other times as necessary.

618.03.5 Traffic Control General Requirements. Meet all traffic control plan requirements before starting work affecting the roadway. Use devices that are new or like new in condition.

Properly maintain, clean, and operate devices when in use. Immediately remove the devices when they are no longer applicable to the work. Cover with opaque material or remove all non-applicable signs from the work.

Remove portable traffic control devices when not in use.

Immediately remove existing signs and other traffic control devices on the present traveled way or on connecting State or Federal routes to be abandoned when they no longer apply. Assure roadways are always appropriately signed. Turn removed signs over to the Department.

Provide functional traffic lanes with signing and channelizing appropriate to the roadway condition at the close of each work day.

Provide the traffic an un-obscured view of the traffic control devices at all times.

Store or park construction equipment, vehicles, materials, and debris at least 10 feet (3 m) behind guardrail or outside the clear zone. When this is impractical, use approved warning devices and protective measures to delineate the item. Only equipment and materials for immediate use or incorporation into the work may be placed within the clear zone.

Store unused traffic control devices outside the clear zone.

Contractor furnished traffic control devices are the Contractor's property. Traffic control devices furnished by the Department or installed on a force account basis are the Department's property.

Repair or replace all damaged traffic control devices at Contractor expense.

If the Contractor fails to provide the required traffic control, the Project Manager will provide the work and deduct the costs from monies due or that may become due the Contractor.

618.03.6 Access Breaks. Submit proposals for temporary breaks in interstate access control or right-of-way fences in writing to the Project Manager for approval.

Access breaks are typically not permitted within 1 mile (1.6 km) of an interchange ramp. Access breaks under 1 mile (1.6 km) may be approved if there are extenuating conditions and the roadway ADT is 750 or less.

Include the following information in the proposal:

1. Intended use of the access break;
2. A sketch showing the location of the proposed access approaches and sight distances;

3. The proposed traffic control. Standard traffic control layout drawings may be used with an area sketch and the stations noted;
4. Security measures for access and right-of-way control;
5. A Contractor statement attesting that the Contractor assumes full liability for area restoration, including the access or right-of-way controls;
6. Any other information pertinent to the use of the access break.

618.03.7 Crossing, Entering, and Using Roadways.

A. General. Construct temporary approaches and crossings with 10:1 side slopes and include drainage provisions.

Remove all temporary approaches and median crossings once the work is complete. Restore and re-seed disturbed areas.

Do not use areas within the right-of-way as borrow sources or disposal areas for the construction or restoration of temporary approaches.

Operate hauling units with the flow of traffic. Do not operate hauling units on roadway shoulders.

B. Limited Access and Multiple-Lane Roadways. Use frontage roads and interchanges for equipment access to the interstate roadway whenever possible.

Do not stop the general traffic on one-way roadways for the convenience of haul units. Use interchanges or a series of appropriate lane closures at temporary access breaks and median crossings for haul-unit operations on one-way roadways.

Haul unit turning movements are restricted to right-turn movements only, when there is access to the project by frontage roads and where left-turn movements by hauling units would pose a hazard to the travelling public.

Submit temporary median crossing proposals for approval. Include the applicable information detailed in Subsection 618.03.7.

Temporary median crossings may be permitted subject to the following guidelines:

1. The distance between any two median crossings, including interchanges, authorized vehicle median crossings, and temporary median crossings must be at least 2 miles (3.2 km).
2. Median crossings must be at least 1,000 feet (305 m) from structures and have a minimum 1,500 feet (458 m) of sight distance at 3.5 feet (1.1 M) above the pavement.
3. Sign median crossings as specified in the Contract.
4. When not in use, protect crossings through median barriers by one of the following methods:
   a. Place an approved impact attenuator at each end of the barrier opening.
   b. Close the inside lanes to traffic with a controlled lane closure.
   c. Close the opening by replacing and pinning the median barrier.

C. Two-Lane Roadways. Always provide at least one functional lane for traffic.

Meet Table 618-1 requirements.

TABLE 618-1
TRAFFIC CONTROL REQUIREMENTS FOR HAULING UNITS ENTERING OR CROSSING 2-LANE ROADWAYS

ADT/LOAD FREQUENCY	TRAFFIC CONTROL REQUIREMENT
Less than 2000 ADT	Stop hauling units for traffic.
2000 to 5000 ADT/Less than 50 loads per shift.	Stop hauling units for traffic.
2000 to 5000 ADT/More than 50 loads per shift.	Provide Flaggers to control traffic.
More than 5000 ADT	Provide Flaggers to control traffic.

The Project Manager may adjust the ADT or load frequency at which flagging is required in Table 618-1.

Where flaggers are not required by Table 618-1, the Contractor may use flaggers and traffic control, with Project Manager approval at Contractor expense.

Limit the number or locations at which flagging is provided at roadway crossings or entrances to:

1. One location per material or plant site; or
2. The number of locations required by an indicated materials source.

618.03.8 Traffic Control at Drop-Off Areas. Temporarily fill drop-offs within 30 feet (10 m) of the shoulder of lanes used by traffic and not protected by guardrail to a 3:1 slope or flatter at the close of work each day or delineate the drop-offs steeper than 3:1 using vertical panels. Panel spacing is determined using the following formula:

$$\textbf{Spacing in Feet (meters)} = \frac{A \times C \times W}{S \times D}$$

Where:
- **A** = Average Daily Traffic Adjustment
- **C** = Degree of Curvature (metric radius factor)
- **W** = Recoverable Width, 4:1 or flatter, from centerline to the drop-off in feet (meters). Measure from the inside edge of the traffic lane on four lane roadways.
- **S** = Posted Speed in M.P.H. (K.P.H.)
- **D** = Average drop-off depth in inches (mm)

Use the following C factor for drop-offs outside of horizontal curves:

Degree of Curve	C	Metric Radius	C
Less than 2°	5800	Greater than 900m	241,000
2° to less than 4°	5200	900m to more than 450m	218,000
4° to less than 6°	4900	450m to more than 300m	203,000
6° or greater	4500	300m or less	188,000

Use the C factor for curves less than 2° curves (greater then 900 m) for drop-offs on the inside of horizontal curves.

Use the following Average Daily Traffic (ADT) adjustment:

ADT	A
Under 750	1.50
750 - 1499	1.30
1500 - 5999	1.00
Over 6000	0.90

Round the computed spacing to the nearest 10 feet (3 m). Do not space panels greater than 390 feet (119 m). Delineate with flexible guideposts or standard delineators spaced at 400 feet (122 m) if computed spacing exceeds 400 feet (122 m).

Use 8-inch (205 mm) by 24-inch (610 mm) vertical panels for computed spacings from 390 feet to 100 feet (119 m to 30 m).

Use 12-inch (305 mm) by 36-inch (915 mm) panels for computed spacings of 90 feet (27 m) or less.

Install panels with the bottom 36-inches (915 mm) above the traveled way surface.

The minimum vertical panel spacing is 40 feet (12 m). Equip alternating vertical panels with Type C steady burn warning lights for computed spacings of 40 feet (12 m) or less.

The Engineer may require installing a positive barrier for computed spacings of 20 feet (6 m) or less if drop-offs will remain un-worked beyond 48 hours.

Maintain 3:1 slopes or flatter where possible. Provide traffic control at Contractor expense for slopes not shaped to 3:1 or flatter where flattening does not impact prosecution of the work.

618.03.9 Traffic Control for Paving and Milling Operations. Provide flaggers at paving and milling machines. Locate the flagger 100 to 150 feet (30 to 46 m) upstream from the machines.

Meet the following requirements for night paving operations:

a. Place a 48 x 48-inch (1,220 X 1,220 mm) "NIGHT PAVING AHEAD" warning sign in advance of each warning sign series;

b. Assure all personnel working on or adjacent to traveled lanes are wearing reflectorized vests or reflectorized exterior clothing. The reflectorized area must be at least 50 square inches (32,260 mm^2) of material visible from any direction.

618.03.10 Temporary Pavement Marking Requirements. Place temporary reflectorized pavement markings or a combination of markings and signs on all sections of newly constructed pavement before opening to traffic. This includes detours, transitions, and all pavement lifts, including friction courses, to be used by traffic.

Use temporary pavement marking tape or tabs or traffic line paint placed under Table 618-3. Meet the signing requirements for no-passing zones specified in note 2 following Table 618-3.

TABLE 618-3
TEMPORARY PAVEMENT MARKING AND SIGNING REQUIREMENTS

Marking Location	Marking Type and Requirements		
	Tabs	Tape	Paint
Centerline - on tangents and curves of 5 degrees and less, Lane lines	3 tabs spaced 2' (610 mm) apart placed every 40' (12.2 m) (4' in 40') (0.6 in 12.2 m)	4" x 4' (102 X 1219 mm) segments placed every 40' (12 m) (4' in 40') (0.6 in 12.2 m)	4" x 4' (102 X 1219 mm) stripe painted every 40 '(12.2 m) (4' in 40') (0.6 in 12.2 m)
Centerline - on curves 5 degrees and greater	3 tabs spaced 1' (305 mm) apart placed every 20' (6.1 m) (2' in 20') (0.6 in 6.1 m)	4" x 2' (102 X 610 mm) segments placed every 20' (6.1 m) (2' in 20') (0.6 in 6.1 m)	4" x 2' (102 X 610 mm) stripe painted every 20' (6.1 m) (2' in 20') (0.6 in 6.1 m)
Centerline - No Passing Zones	Not Used (See note 2)	Solid double 4" (102 mm) strips or 4" x 2' and (102 X 610 mm) 4" x 4' segments (102 x 1219 mm) plus signing (See notes 1 & 2)	Solid double 4" (102 mm) painted stripes or 4" x 2' (102 X 610 mm)and 4" x 4' painted (102 X 1219 mm) stripes plus signing (See notes 1 & 2)

NOTES:

1. Use 4" x 2' (102 X 1220 mm) tape segments or paint stripes placed every 40'(12.2 m) on tangents and curves of 5 degrees and less. Use 4" x 2' (102 X 1220 mm) tape segments or paint stripes placed every 20 feet (6.1 m) on curves of 5 degrees and greater.
2. Use No-passing zone signing consisting of one 48 x 60-inch (1220 X 1525 mm) "DO NOT PASS" (R4-1) placed on the right-hand side of the roadway at the beginning of each zone and one 48 x 60-inch (1220 X 1525 mm) "PASS WITH CARE" (R4-2) placed at the end of each zone. Use 24 X 30-inch (610 mm X 760 mm) only with the Project Manager's approval.
3. Use White tabs, tape, and paint on all one-way multi-lane roadways. Use yellow on all 2 lane roadways.
4. Apply paint striping, including application rates meeting Section 620 requirements.
5. Remove all temporary pavement markings that conflict with interim or final pavement markings at Contractor expense.
6. For Seal Coat operations, place 4 equally-spaced tabs over existing 10 foot (3 m) centerline stripes.
   A. **Temporary Pavement Markings.** Temporary pavement markings may be used for a maximum 3 calendar days on pavements under traffic. Place final centerline marking and lane line stripes meeting Section 620 requirements after the 3 day period. The Project Manager will suspend paving operations if the final striping is not applied by the end of the 3 day period.

If the final striping is not applied within 10 calendar days after the temporary striping was applied, the Project Manager may have the work performed deducting all costs from monies due or that may become due the Contractor.

B. **Interim Striping.** Before seasonal suspension of work, stripe newly constructed pavements, including partially completed sections, meeting Section 620 requirements. The striping includes centerline with no-passing zone controls, lane lines, and shoulder lines.

618.03.11 Traffic Control For Seal Coat Operations.

A. **Two-Lane Two-Way and Multiple-lane Two-Way Roadways.** Control traffic with pilot cars for the first 48 hours, or longer as directed, after the seal coat is applied. The 48 hours begin at the end of the Contractor's work shift in each six mile (9.6 km) section.

The Department will pay for all pilot cars, flaggers, signs and devices used for the initial 48 hours of pilot car operation on each 6 consecutive roadway miles (9.6 km) of seal and cover work and on any remaining section less than 6 miles (9.6 km).

Pilot car operation beyond 48 hours, unless ordered by the Project Manager, is at Contractor expense.

Pilot car use may be discontinued after 48 hours if temporary pavement markings or final centerline marking are in place.

Place pavement markings on centerline, including no-passing zone controls, and lane lines within 3 calendar days of terminating pilot car use within each 6 mile (9.6 km) or fractional section.

Liquidated Damages will be assessed at $500.00 per day for each two lane traffic mile not striped by the above time limit.

If stripping is not placed within 7 calendar days the Department will have the work performed and deduct the costs from monies owed the Contractor.

Ceasing pilot car use is the end of the initial 48 hours of pilot car operation or when its terminated by the Project Manager.

Place "LOOSE GRAVEL" (W8-7) signs, each with a 30 x 30-inch (760 X 760 mm) advisory speed plate "35 MPH" (W13-1), at each end of each work zone. Place the same sign combination for each direction of travel at 2 mile (3.2 km) intervals within the work zone. Leave the signs in place until all sweeping and striping within the zone are completed.

Place additional work zone signing when sweeping work is performed outside the flagger and pilot car area.

B. **Interstate Highways.** Use lane closures and lane control for seal coat operations on interstate highways. Pilot car operations are not allowed unless otherwise specified.

Meet the "LOOSE GRAVEL" and "35 MPH" sign requirements as specified for two-way roadways. Sign both sides of the roadway.

Place final pavement markings meeting Section 620 within 3 days of completing seal coat operations.

618.03.12 Traffic Control For Striping Operations. Provide the following traffic control for striping operations.

A. Furnish a shadow vehicle to follow the pavement striping vehicle within 500 to 1000 feet (152 to 305 m).

B. Equip shadow vehicles with an arrow board facing rear-approaching traffic.

C. On multiple-lane roadways place the arrow board display in the sequential arrow mode (lane shift).

D. On two-lane two-way roadways place the arrow board in a hazard warning mode not displaying the lane-shift mode.

618.03.13 Traffic Control Device Location and Installation. Lay out the standard distances for traffic control devices to within an accuracy of plus or minus 5%. The Project Manager may direct adjustments to the device locations to fit site conditions.

Display all signs with the legend not more than 5 degrees (1 inch per foot) (25 mm per 305 mm) from the horizontal plane.

Display the signs at the required mounting height with the hinged signs closed or non-hinged signs removed when not applicable.

Use only one type of reflective sheeting in each sequence or group of signs or devices.

Stabilize sign trailers to prevent movement by wind or passing vehicles.

Assure the G20-1 ("ROAD CONSTRUCTION NEXT (X) MILES) and G20-2 (END CONSTRUCTION) signs do not conflict with other construction signing. Remove these signs when directed.

Post-mount work zone traffic control devices to remain at the same location for more than 3 consecutive days. Trailer-mounted W20-7a (flagger ahead) signs with generators are excluded from this requirement.

Install work zone traffic control devices sequentially toward the work area beginning with the device located farthest from the work area. Remove sequentially in the opposite direction.

Use arrow boards in the sequential or flashing-arrow mode to supplement channelizing devices and standard signing when one or more lanes of a multiple-lane roadway are closed.

Do not use arrow boards in the sequential or flashing-arrow mode for lane closures or at flag stations on two-lane two-way roadways.

Do not use flexible guide posts in place of the specified hazard identification devices for shoulder drop-offs or other hazards adjacent to the travel lanes. Refer to Subsection 618.03.8.

Flexible reflectorized warning signs are acceptable for daylight hour use.

Do not use traffic cones for channelization devices.

Do not use steel barrels for work zone traffic control.

618.03.14 Flagging Operations. Provide flaggers that are competent and equipped as required in the Department's booklet "Flaggers Handbook" furnished by the Department.

Maintain constant radio contact between flaggers at each end of a work zone and pilot vehicles when visual contact is not possible. Use two-way V.H.F. or U.H.F. FM radios, operable in the terrain.

Place the W20-7a (flagger ahead) warning sign signals so they are visible 2,000 feet (610 m) in advance of the sign. Place and operate the sign only when a flagger is at the flag station.

Use reflectorized flagger devices and garments for night work. Furnish lighting that makes the flaggers clearly visible from 500 feet (153 m).

Provide a second flagger when more than 10 vehicles are stopped at a flag station 50% of the time to advise traffic of the delay. Place an additional W20-7a sign 500 to 1000 feet (153 to 305 m) ahead of the average end of the stopped vehicle line.

618.03.15 Pilot Car Operations. Use pilot cars as specified. Equip the cars with amber flashing lights, flags, and the G20-4 sign designated in Part VI of the MUTCD. Mount the sign in a conspicuous position on the vehicle with the bottom sign edge at least 6 feet (1.8 m) above the ground.

Schedule and cycle pilot vehicles to depart each flag station at maximum 15 minute intervals.

618.03.16 Water For Dust Control. Furnish and apply dust control water as required.

618.04 METHOD OF MEASUREMENT. The estimated Contract quantities for traffic control devices, temporary pavement markings, flagging, and pilot car operation are an estimate only and may vary from the actual quantities used or required in the Contract. No additional compensation is considered or allowed due to these quantity differences.

618.04.1 Traffic Control Devices. Traffic control devices are measured by the units of traffic control devices used and accepted. A unit of traffic control device is the base value used for establishing the relative value of each type of traffic control device. The relative value of each traffic control device in units is shown in the "Traffic Control Rate Schedule" included in the Contract.

Signs and devices must be in new or like-new condition to be measured for payment.

618.04.2 Temporary Pavement Markings. Temporary pavement markings are measured by the mile (kilometer) to the nearest 0.1 mile (0.16 km) for each application of markings. Only one application of temporary pavement markings is measured for payment on any one lift of pavement at the same location.

One mile (1.6 km) of temporary pavement markings consist of either 1 mile (1.6 km) of centerline striping or 1 mile (1.6 km) of lane line striping between any 2 lanes of a two-lane or multiple-lane roadway.

Temporary pavement marker tabs installed during seal and cover operations are not measured for payment.

No-passing zone signs used in combination with temporary pavement markings are measured separately as traffic control devices.

No-Pass zone signs required after the initial 48 hours of pilot car operation are not measured for payment.

Interim and final striping is measured under Section 620.04.

618.04.3 Flagging. Flagging is measured by the hour for the actual number of approved flagging hours provided on the project by each flagger used.

Travel time for flaggers to and from the project is not measured for payment.

618.04.4 Pilot Car Operation. Pilot car operation is measured by the hour for the approved number of hours of operation for each properly equipped pilot car.

618.04.5 Water For Dust Control. Dust control water is measured by the 1000 gallon (3785 L) units used and accepted. This quantity is converted to units of traffic control by multiplying the quantity by the relative value in units per M Gallon (Kiloliter) units shown in the "Traffic Control Rate Schedule".

Measurement will be by an approved meter or load counter or by manual count of the number of loads of a known quantity applied on the roadway.

No measurement is made of water used on haul roads or for dust conditions that, in the Project Manager's opinion, are not detrimental to the traveling public.

618.04.6 Items Not Eligible For Separate Payment. The following items are not measured or paid for separately.

1. Amber flashing or strobe lights on equipment, vehicles, and hauling units.
2. Impact attenuators for median barrier openings.
3. Permits and costs relating to project access.
4. Construction, drainage, maintenance, removal, restoration and reseeding of areas used for temporary roads, approaches, and crossovers.
5. Radios for flaggers and pilot vehicles.
6. Illumination of flag stations and work areas.
7. Reflectorized safety equipment, garments, and headgear.
8. Vehicle-mounted arrow boards on stripers and shadow vehicles.
9. Replacing temporary pavement marking tabs and tape destroyed by traffic.
10. Temporary pavement marking tabs used for seal coat operations.
11. Costs to clean and maintain installed traffic control devices.
12. Covering or removing non-applicable signs or signs not in use.
13. Other miscellaneous materials and equipment required for proper traffic control that are not included in the "Traffic Control Rate Schedule".

618.05 BASIS OF PAYMENT.

618.05.1 Traffic Control Devices. Payment for the completed and accepted quantities is made under the following:

Pay Item	Pay Unit
Traffic Control Device	Unit
Temporary Pavement Marking	Mile (kilometer)
Flagging	Hour
Pilot Car	Hour
Water	Unit

Traffic control devices are paid for at the contract unit price per unit of traffic control devices. The units of each type of traffic control device paid for are

calculated by multiplying the measured quantity of each device by the value in units per each unit shown in the traffic control rate schedule.

Payment for traffic control devices is made for each setup directed by the Project Manager.

Replacing properly installed traffic control devices destroyed by traffic is paid for at the contract unit price per unit of traffic control devices.

Flexible guide posts for plant mix paving, placing asphalt mix leveling courses, and cold milling operations are paid for at the full rate on a day-by-day basis for each lift of each traffic lane with work underway. Guide posts placed beyond 1,500 feet (458 m) of the work termination point for that day are not eligible for payment.

Payment for barricades and drums includes the required ballast.

Payment for signs mounted on barricades is made only for the original mounting.

Payment for flashing arrow boards is made only for the actual hours of operation approved by the Project Manager. Payment includes the cost of operating the trucks or trailers on which the arrow boards are mounted.

Paint striping removal is paid for at the contract unit price per unit of traffic control devices.

Payment at the contract unit price is full compensation for all resources necessary to complete the item of work under the Contract.